REMARKS

Claims 1-18 and 20-136 are in the case.

All objections and rejections are respectfully traversed.

§ 102 Rejections

In the Office Action, claims 27-38, 44-46 and 48-52 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent Number 6,266,658 to Adya, *et al.*, hereinafter "Adya".

Differences Between the Claimed Invention and the Cited Art

The MPEP at § 2131 states:

"'A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.'" The MPEP quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Representative claim 27 recites:

27.   A system for evaluating a plurality of candidate index sets for a workload in a database system, the workload derived from a plurality of statements, the system comprising:
a workload evaluator which evaluates each statement within the workload using collected database statistics;
an index solution evaluator which, responsive to the workload evaluator, evaluates each index in a candidate index set with respect to the workload, the candidate index solution being one of the plurality of candidate index sets, each ***candidate index set derived from an index superset formed by the union of a current index set and a proposed index set***;
a solution/rollup evaluator which, responsive to the index solution evaluator, evaluates the candidate index solution; and
a solution refiner which, responsive to the solution/rollup evaluator, generates at least one new candidate index solution, the at least one new candidate index solution being incorporated into the plurality of candidate index sets.

The Applicants respectfully submit that Adya fails to expressly or inherently describe the Applicants' claimed *candidate index set derived from an index superset formed by the union of a current index set and a proposed index set.*

In the Office Action dated April 4, 2005, the Examiner claims that Adya teaches this claimed aspect of the Applicants' invention at column 7, lines 39-40 and column 8, lines 4-6. The Applicants respectfully disagree.

At column 7, lines 39-40 and column 8, lines 4-6, Adya describes various restrictions that could be applied to a set of candidate indexes to reduce the number of indexes that are considered in the overall index selection process in order to make the index selection process less complex and/or run faster. Specifically, the set of candidate indexes is formed by (1) parsing queries in a workload to identify indexes that may satisfy the queries and (2) placing the identified indexes in the set of candidate indexes. After the set is formed various restrictions are applied to the set in order to <u>filter out</u> (i.e., remove) certain undesirable indexes. These restrictions include limiting the type of indexes to single, covering and foreign indexes as well as limiting indexes based on various advanced features of the SQL server which are known to require higher overhead and may further complicate the index selection process. The end result is a set of candidate indexes which are geared towards making the index selection process less complex and/or run faster.

The Applicants, on the other hand, claim forming a candidate index set from a <u>union</u> of a current index set and a proposed index set which is different than the scheme disclosed by Adya. Forming the union of two sets is not the same thing as forming a set of indexes by parsing queries and then removing undesirable indexes from the set. Forming a set from a union of two sets of indexes involves a logical inclusive OR **mathematical operation** which logically combines the indexes (elements) contained in the two sets to form a set which contains a <u>single</u> <u>copy</u> of all of the elements in both sets. Formally this mathematical operation is represented as:

x **is an element of** $A \cup B$ <u>**if and only if**</u> x **is an element of** A <u>**or**</u> x **is an element of** B.

This is quite different that the technique Adya teaches to form a candidate index set.

To illustrate this difference, assume, for example, that a current index set contains the elements {A, B} and a proposed index set contains the elements {C, D}. In accordance with the Applicants' claimed invention, the candidate index set is formed by taking the union of the two sets which yields a candidate index set of {A, B, C, D}. In Adya's scheme, first a set of

candidate indexes are determined by parsing queries that belong to a workload to identify indexes that could be useful in satisfying the queries. Next, restrictions are applied to the candidate indexes to filter out undesirable indexes that meet certain criteria. Thus, for example, assume the set of candidate indexes identified by parsing the queries forms a set of candidate indexes that contains the elements {A, B, C, D}. Now assume that index "C" meets one of the restrictions described by Adya (e.g., the index would be a new clustered index). According to Adya, "C" would be removed from the set yielding a set of candidate indexes that contains the elements {A, B, D}. Note that the two schemes are very different. The Applicants' claimed invention involves <u>combining</u> sets using the well-known **mathematical union operation** to produce a set of candidate indexes whereas Adya, on the other hand, produces a set of candidate indexes by (1) parsing queries to identify indexes that belong to the set and (2) <u>removing</u> indexes from the set based on certain restrictions. This is quite different than what is claimed by the Applicants.

Because of the absence of a *candidate index set derived from an index superset formed by the union of a current index set and a proposed index set* in Adya, the Applicants respectfully submit that Adya fails to render claims 27-38, 44-46 and 48-52 anticipated under 35 U.S.C. § 102. Therefore the Applicants respectfully request that the above rejections of claims 27-38, 44-46 and 48-52 be withdrawn.

§ 103 Rejections
    In the Office Action, claims 1-6, 8-12, 16, 18, 20, 22-24, 26, 53-54, 56, 58-60, 62-64, 66-70, 74, 76-77, 79-81, 83-86, 88-90, 92-96, 100, 102-103, 105-107, 109-113, 115-117, 119-123, 127, 129-130, 132-134 and 136 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent Number 5,960,423 to Chaudhuri, *et al.*, hereinafter "Chaudhuri I" and in view of U.S. Patent Number 6,223,171 to Chaudhuri, *et al.*, hereinafter "Chaudhuri II", claims 7, 65, 91 and 118 were rejected under 35 U.S.C. § 103 as being unpatentable over "Chaudhuri I" and "Chaudhuri II" and in further view of U.S. Patent Number 5,924,088 to Jakobsson, *et al.*, hereinafter "Jakobsson", claims 13-15, 71-73, 97-99 and 124-126 were rejected under 35 U.S.C. § 103 as being unpatentable over "Chaudhuri I" and "Chaudhuri II" and in further view of U.S. Patent Number 6,003,022 to Eberhard, *et al.*, hereinafter "Eberhard", claims 39-41 were rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Eberhard, claims 17,

75, 101 and 128 were rejected under 35 U.S.C. § 103 as being unpatentable over "Chaudhuri I" and "Chaudhuri II" and in further view of U.S. Patent Number 5,404,510 to Smith, *et al.*, hereinafter "Smith", claim 43 was rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Smith, claims 21, 78, 104 and 131 were rejected under 35 U.S.C. § 103 as being unpatentable over "Chaudhuri I" and "Chaudhuri II" in further view of U.S. Patent Number 6,021,405 to Celis, *et al.*, hereinafter "Celis", claim 47 was rejected under 35 U.S.C. § 103 as being unpatentable over Adya in view of Celis, claims 25, 82, 108 and 135 were rejected under 35 U.S.C. § 103 as being unpatentable over "Chaudhuri I" and "Chaudhuri II" in further view of Adya, claims 55, 61, 87 and 114 were rejected under 35 U.S.C. § 103 as being unpatentable over "Chaudhuri I" and "Chaudhuri II" in further view of Gurry, *et al.* "Oracle Performance Tuning", hereinafter Gurry, Claim 57 was rejected under 35 U.S.C. § 103 as being unpatentable over Adya in further view of Gurry, and claim 42 was rejected under 35 U.S.C. § 103 as being unpatentable over Adya in view of Finkelstein, *et al.*, "Physical Database Design for Relational Database", hereinafter "Finkelstein".

Differences Between the Claimed Invention and the Cited Art

The MPEP at § 2143 states:

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations."

Representative claim 1 recites:

1. A method for evaluating a plurality of candidate index sets for a workload of database statements in a database system, the method comprising:
  forming an index superset from a union of a current index set and a proposed index set;
  deriving a candidate index set from the index superset, the derived candidate index set being incorporated into the plurality of candidate index sets;
  analyzing collected database statistics based on the derived candidate index set; and
  presenting the analyzed collected statistics.

The Applicants respectfully submit that "Chaudhuri I", "Chaudhuri II", Jakobsson, Eberhard, Adya, Smith, Celis, Gurry and Finkelstein taken either individually or in combination fail to teach or suggest the Applicants' claimed *forming an index superset from a union of a current index set and a proposed index set*.

In the Office Action dated April 4, 2005, the Examiner claims that "Chaudhuri I" teaches this claimed aspect of the Applicants' invention. Specifically, the Examiner claims that "Chaudhuri I" teaches storing "what-if" indexes and existing indexes and that by storing these indexes "Chaudhuri I" teaches forming an index superset. Moreover, the Examiner claims that the "what-if" indexes are formed from existing indexes and proposed indexes which are absent from the database and therefore form a union of current indexes and proposed indexes as claimed by the Applicants. The Applicants respectfully disagree.

Storing two sets of indexes into a single set is not the same as forming a union of the two sets. Storing a set of indexes into a single set merely involves combining the two sets by placing the elements of each set into the single set. On the other hand, as noted above, forming a set from a union of two sets of indexes involves a logical inclusive OR operation which logically combines the indexes (elements) contained in the two sets to form a set which contains a <u>single copy</u> of all of the elements in both sets.

Just because storing the elements of two disjoint sets (i.e., sets that have no elements in common) into a single set yields a result that is the same had the sets been combined by taking a union of the sets does <u>not</u> make the storing of the sets the same operation as forming the union of the sets. As argued in the Applicants' reply filed on December 17, 2005, the operation of storing the elements of two sets into a single set may yield a different result than the operation of forming a union of the two sets. Thus, the two operations are <u>not</u> equivalent. The Applicants clearly claim *forming an index superset from a union of a current index set and a proposed index set* which involves performing a mathematical union operation on the current index set and the proposed index to form the index superset which is clearly a different operation than what is taught by "Chaudhuri I".

Regarding the other cited art, as noted in the Applicants' previous reply filed on December 17, 2005, "Chaudhuri II", Jakobsson, Eberhard, Adya, Smith, Celis, Gurry and Finkelstein do not teach the Applicants' claimed *forming an index superset from a union of a current index set and a proposed index set*.
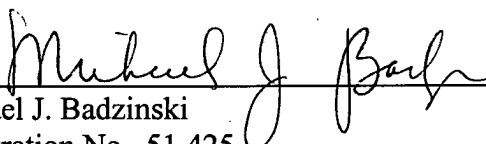
Because of the absence of *forming an index superset from a union of a current index set and a proposed index set* in "Chaudhuri I", "Chaudhuri II", Jakobsson, Eberhard, Adya, Smith, Celis, Gurry and Finkelstein, the Applicants respectfully submit that "Chaudhuri I", "Chaudhuri II", Jakobsson, Eberhard, Adya, Smith, Celis, Gurry and Finkelstein do not render the Applicants' claims 1-18, 20-26, 39-43, 47 and 53-136 obvious under 35 U.S.C. § 103. Therefore, the Applicants respectfully request that the above-rejections to these claims be withdrawn.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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